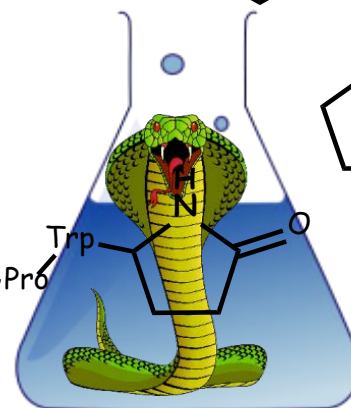
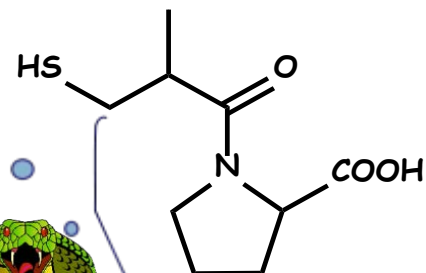
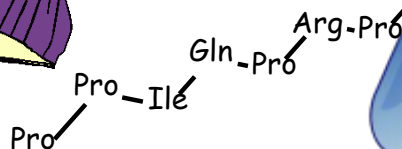
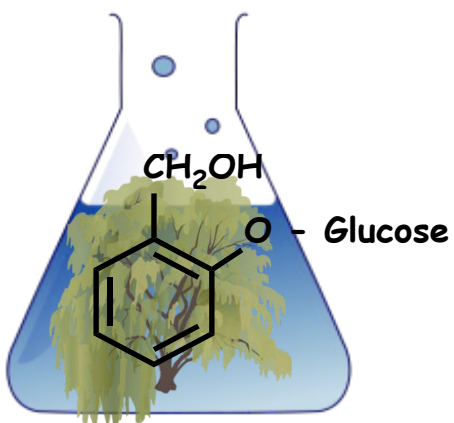
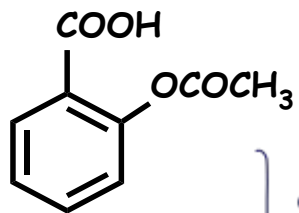
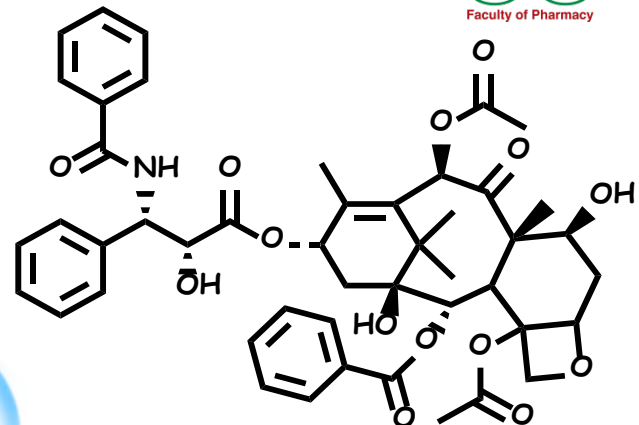
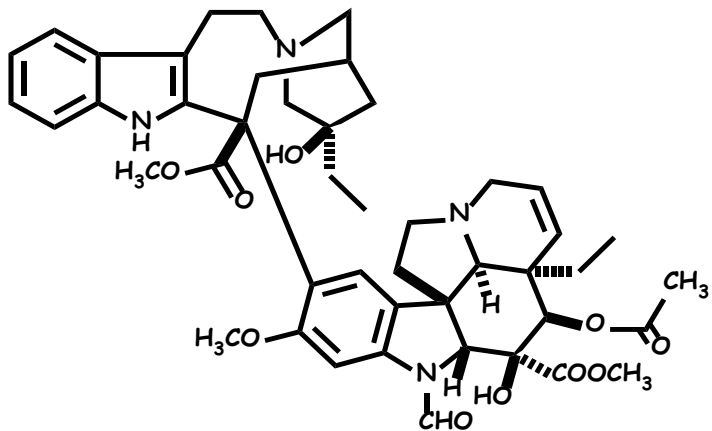


# NATURAL PRODUCTS IN MODERN MEDICINE



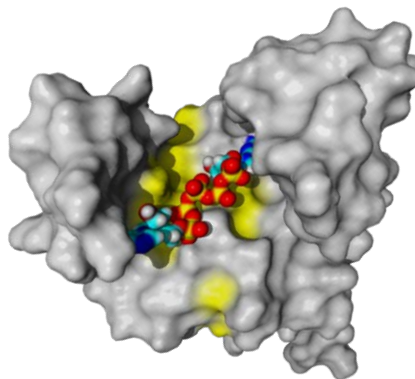
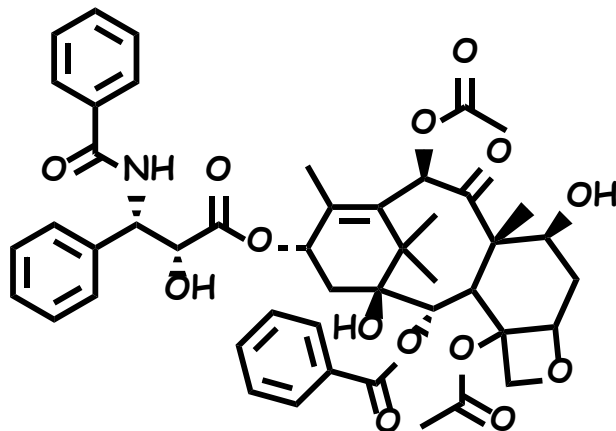
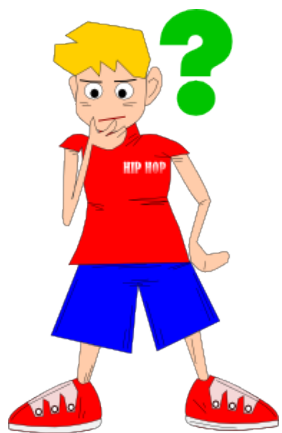
# DR. OMAR SABRY



# NATURAL PRODUCTS IN MODERN MEDICINE

## Topics to be Studied

- ❑ Why We Are Studying Natural Products?
- ❑ Role Of Natural Products In Modern Medicine?
- ❑ Future Of Natural Product In Drug Discovery?



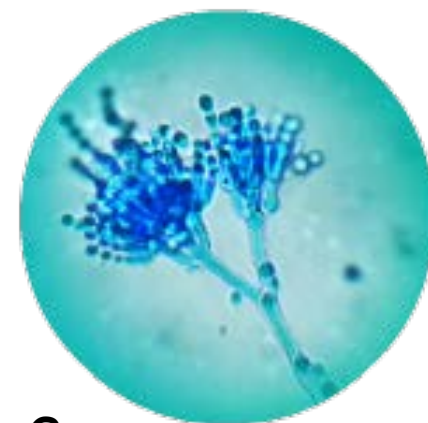
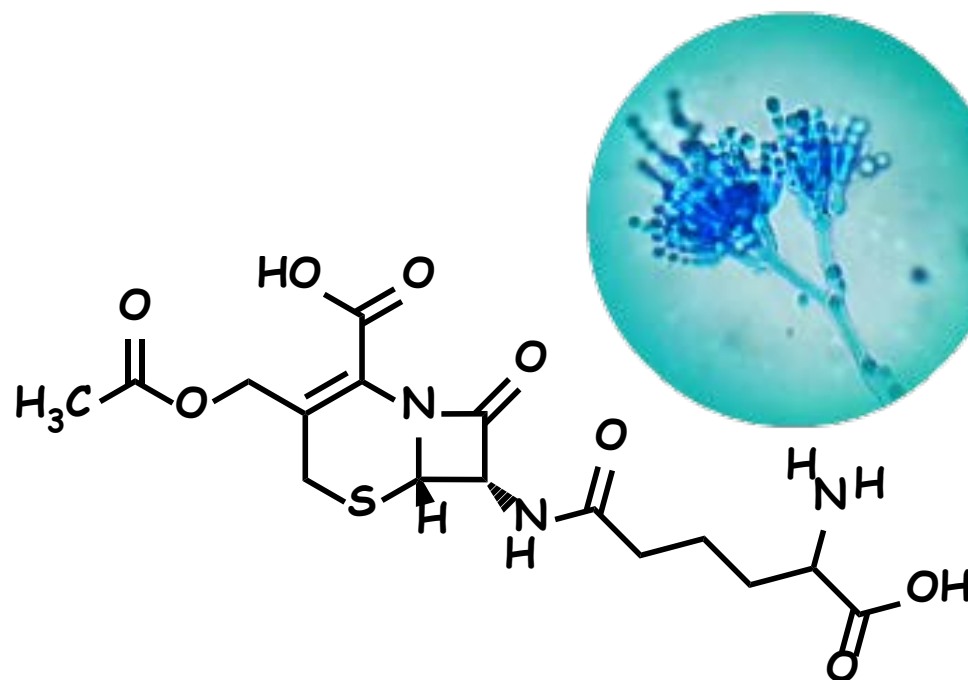
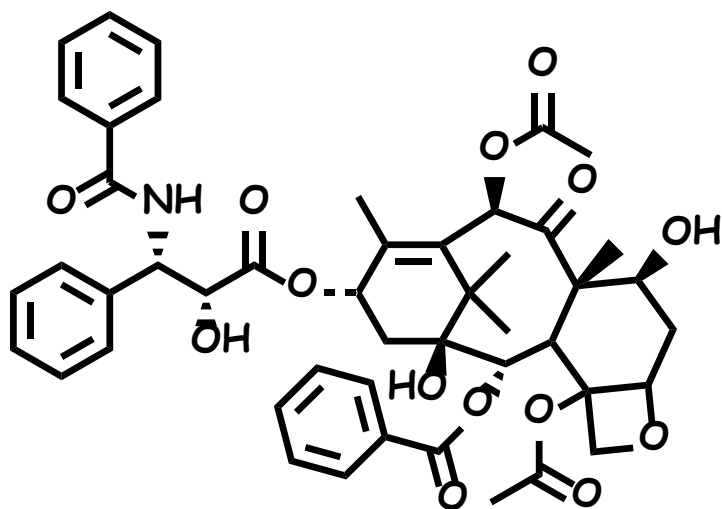


# INTRODUCTION



❑ **Natural products are the most important**

- **Anticancer agents (e.g. Taxol – Vinca alkaloids).**
- **Anti-infective agents (e.g. Cephalosporins).**



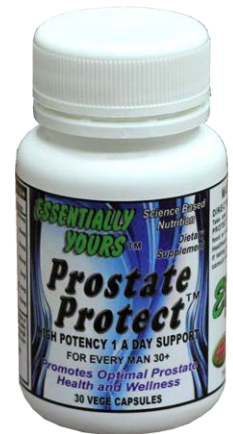
***Cephalosporium acremonium***



# INTRODUCTION



**□- Prescription drugs containing phytochemicals were valued at more than US \$30 billion in 2002 in the USA.**

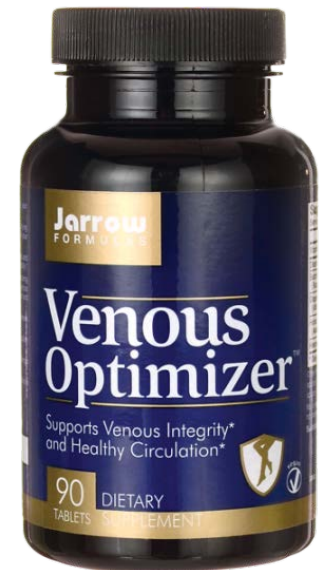




# INTRODUCTION



**❑ Currently one-fourth of all prescribed pharmaceuticals in industrialized countries contain compounds that are from plants.**

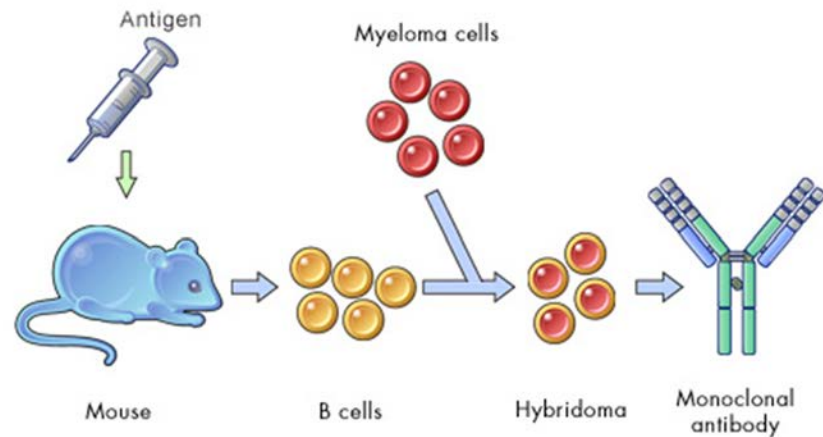
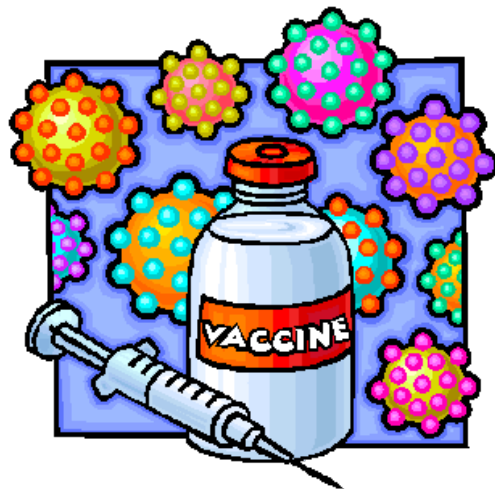




# INTRODUCTION



**□ More than 80% of approved drugs are either natural products or related to them, including biologicals such as vaccines and monoclonal antibodies.**

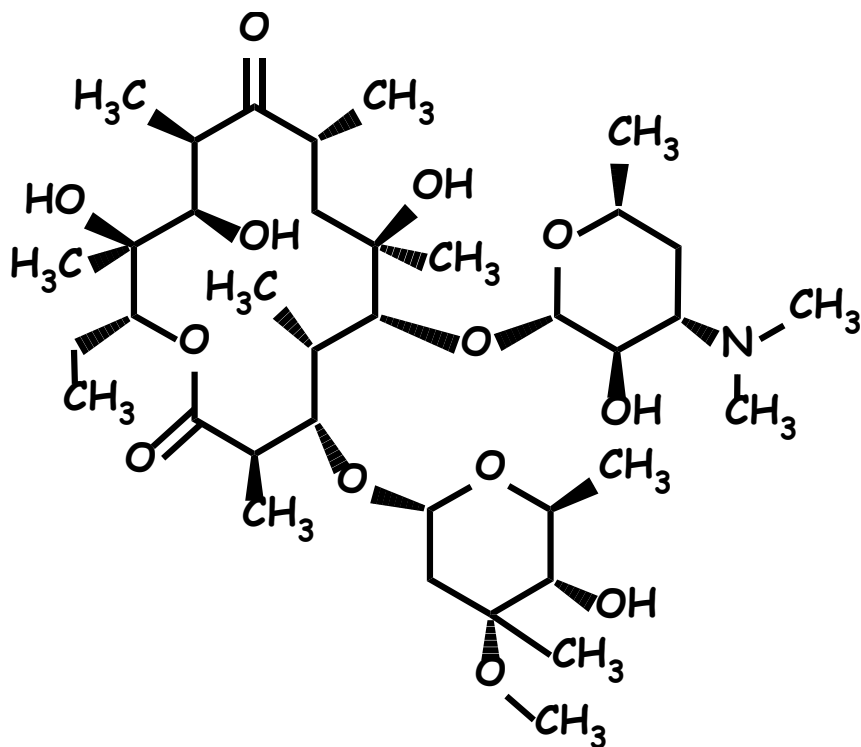




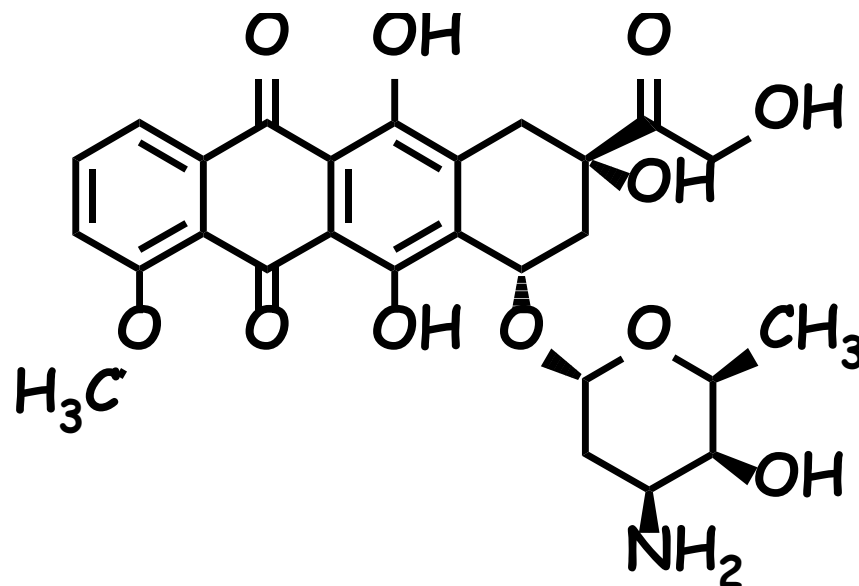
# INTRODUCTION



❑ **Nature is still the main source for pharmaceutical compounds.**



**Stryptomycin**



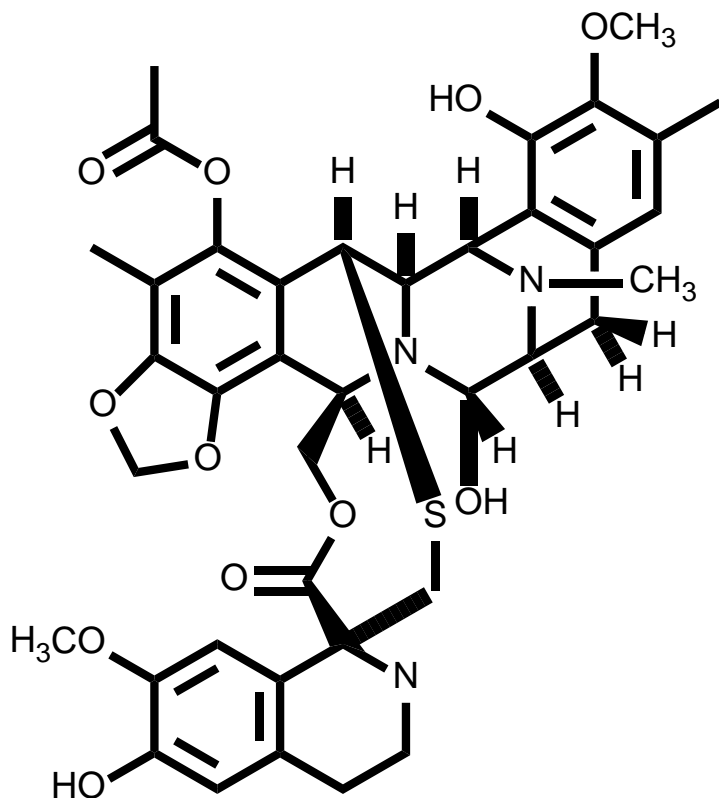
**Adriamycin**



# INTRODUCTION



## Trabectedin (ET-743)

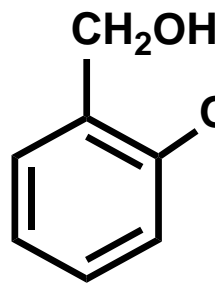


**□ Marine alkaloid from Caribbean tunicate. Characterized by three Tetrahydroisoquinoline rings.**

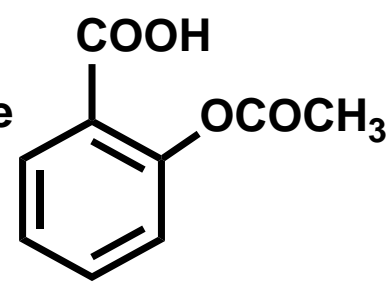


# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

- ❑ **1) Production of synthetic analogues affording less toxic and more effective drug molecules.**
- ❑ **A) The lead compound of aspirin (Salicin) has been known since the fifth century BC, at which time it was extracted from Salix bark by Hippocrates.**



Salicin

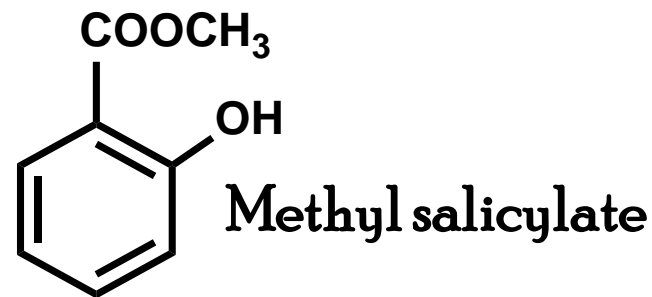
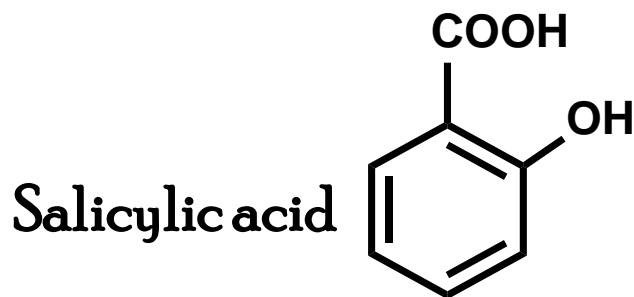


Acetyl salicylic acid

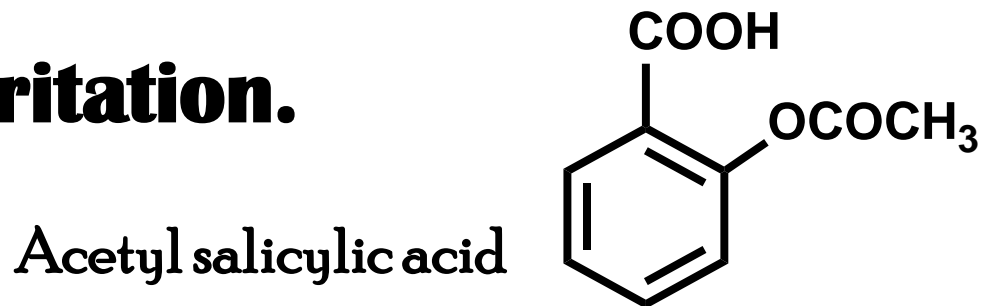


# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

❑ **Synthetic salicylates were produced on a large scale in 1874 by the Bayer Company in Germany.**



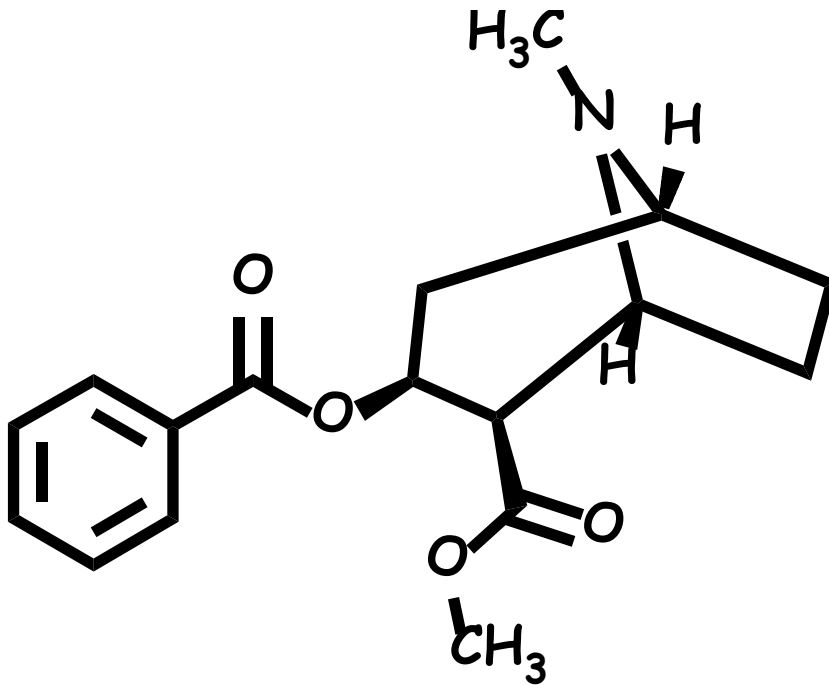
❑ **In 1897, Bayer discovered that its acetyl derivative was able to reduce its acidity, bad taste and stomach irritation.**



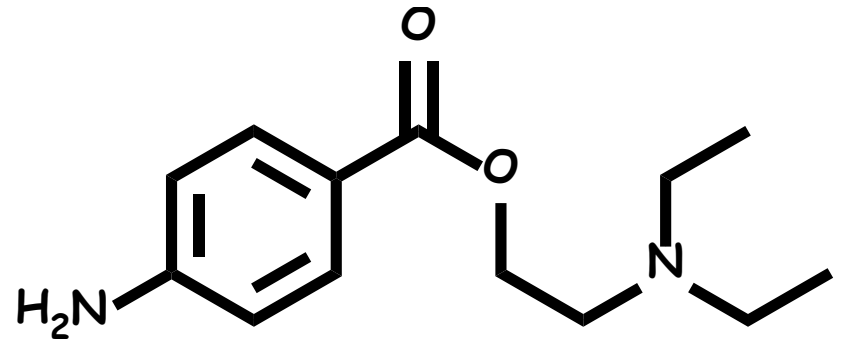


# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

## ❑ B- Procaine from Cocaine.



**Cocaine**



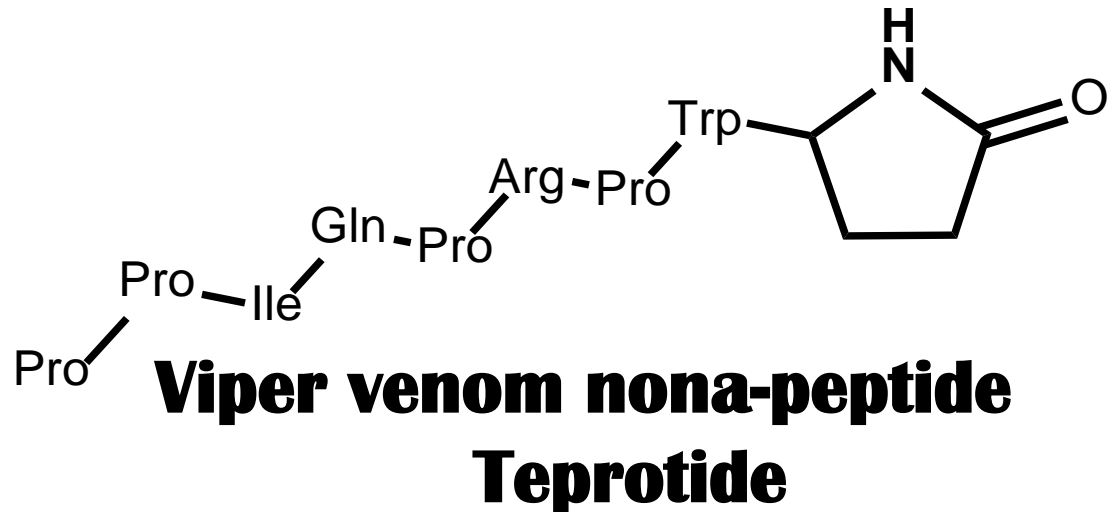
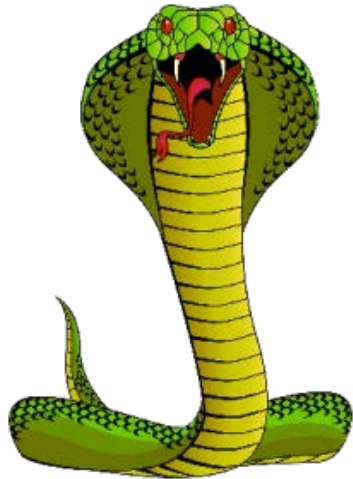
**Procaine**  
**Local anesthetic**



# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

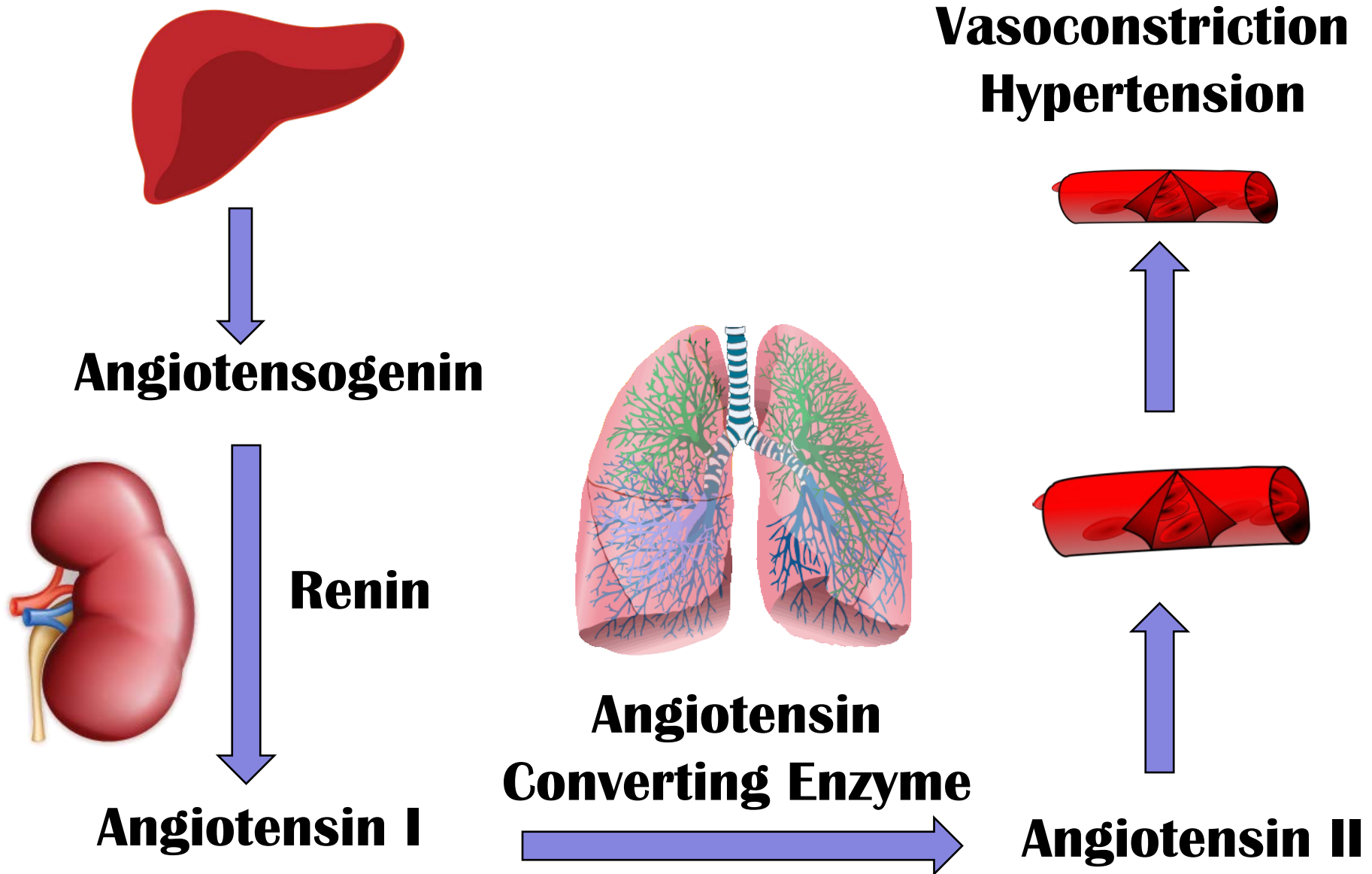
☐ **II) Natural poisons can be converted to safe drugs**

**❑ The anti-hypertensive angiotensin converting enzyme (ACE) inhibitor captopril is derived from the viper venom nona-peptide teprotide (1965 – 1981).**



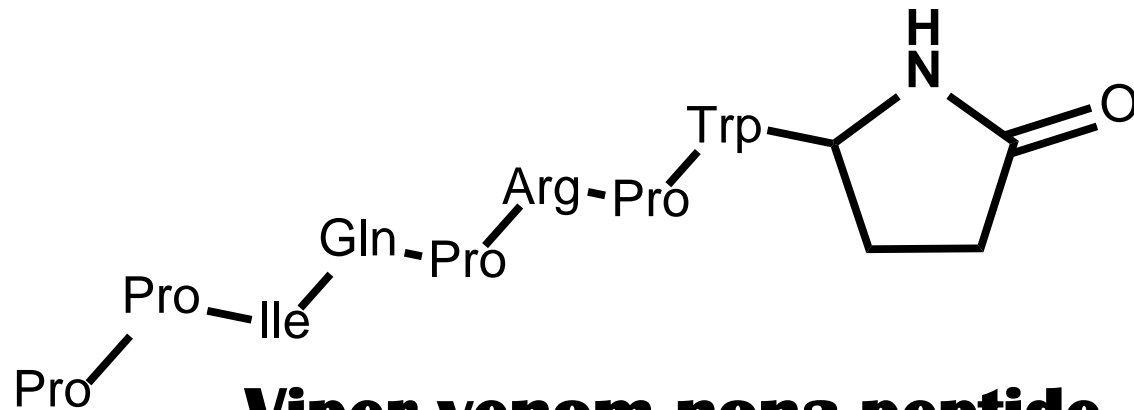


# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

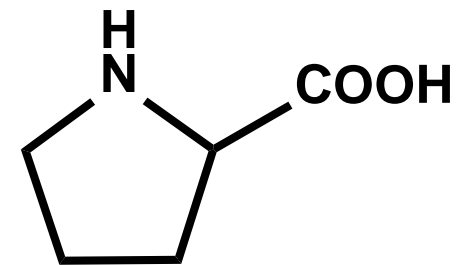
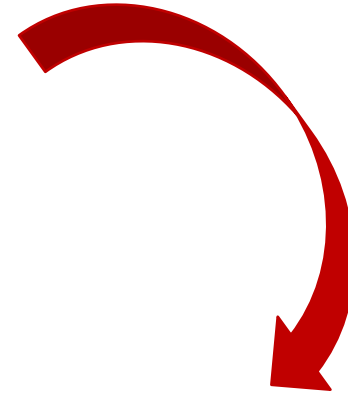




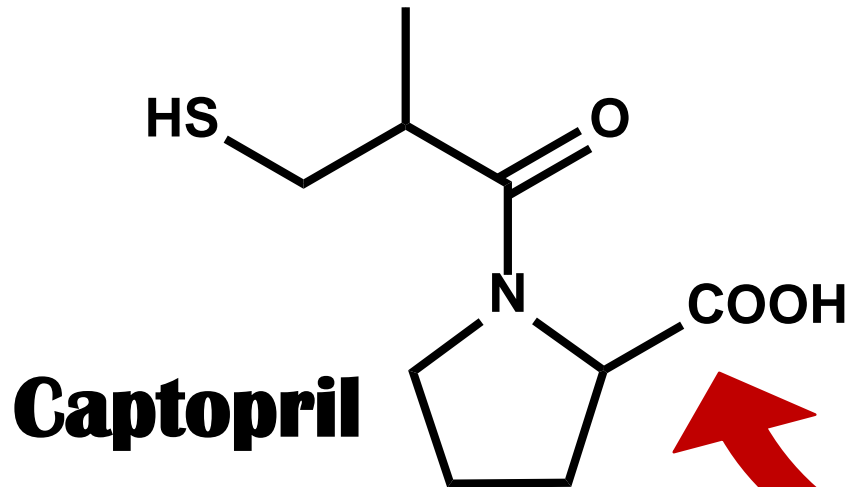
# ROLE OF NATURAL DRUGS IN MODERN MEDICINE



# Viper venom nona-peptide Teprotide



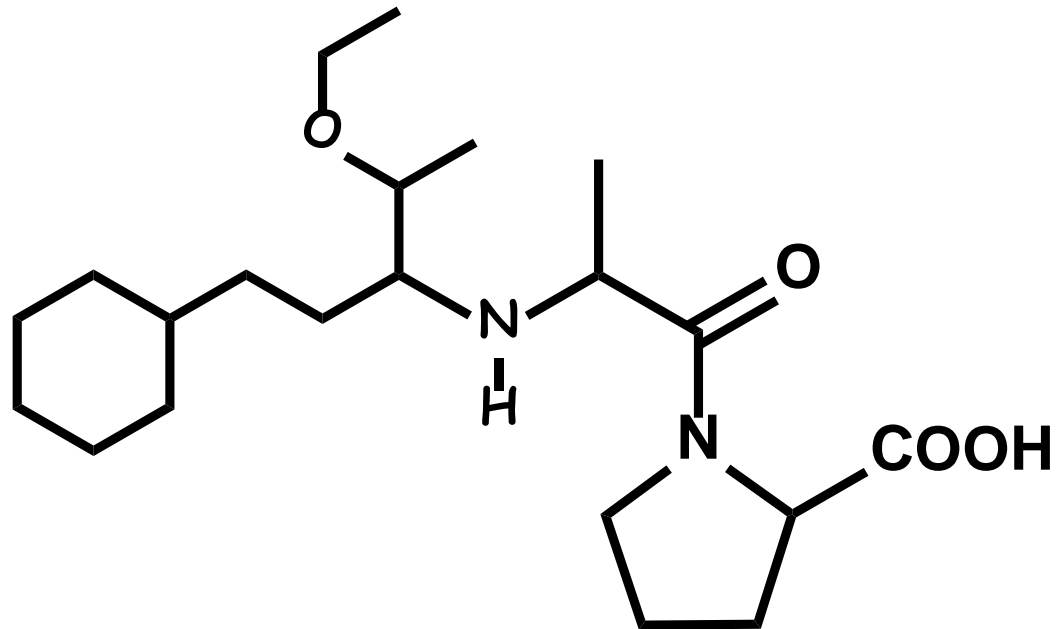
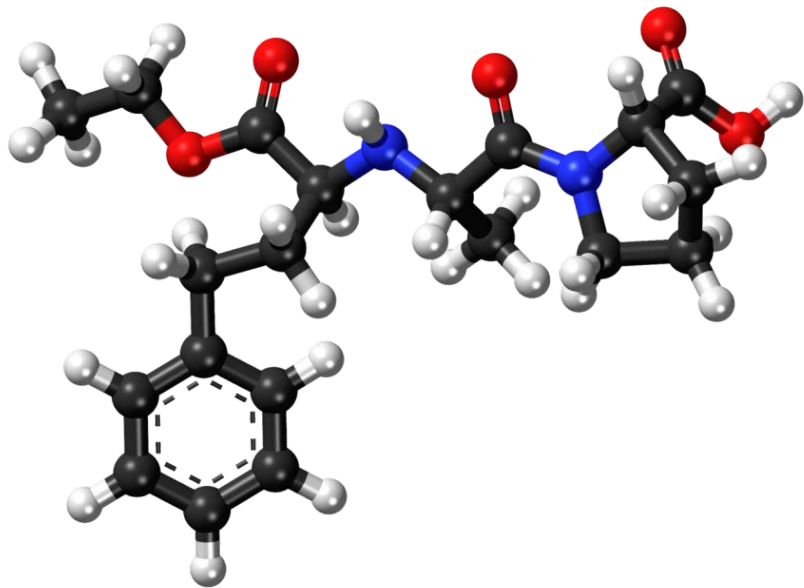
# Proline



# Captopril



# ROLE OF NATURAL DRUGS IN MODERN MEDICINE



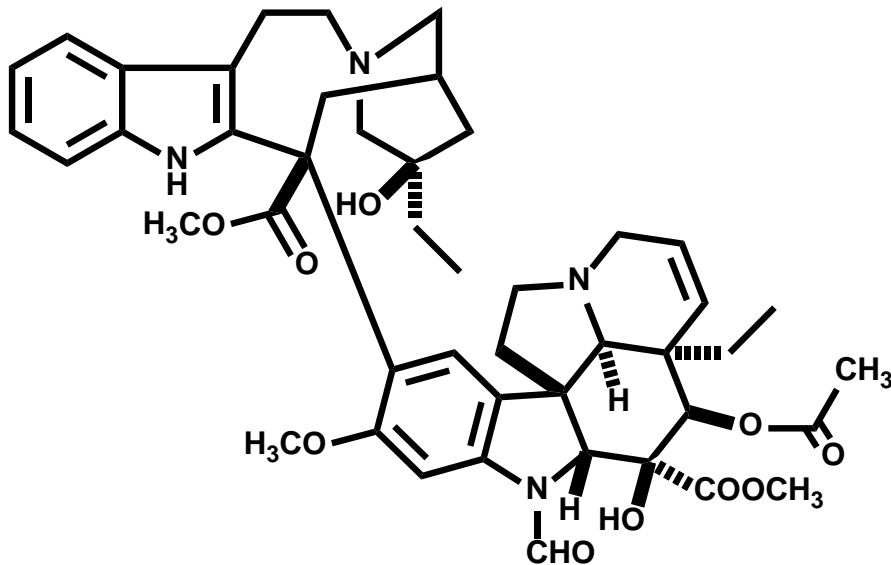
**Enalapril (Vasotec)**

**All ACE Inhibitors are derived from Viper Venum**

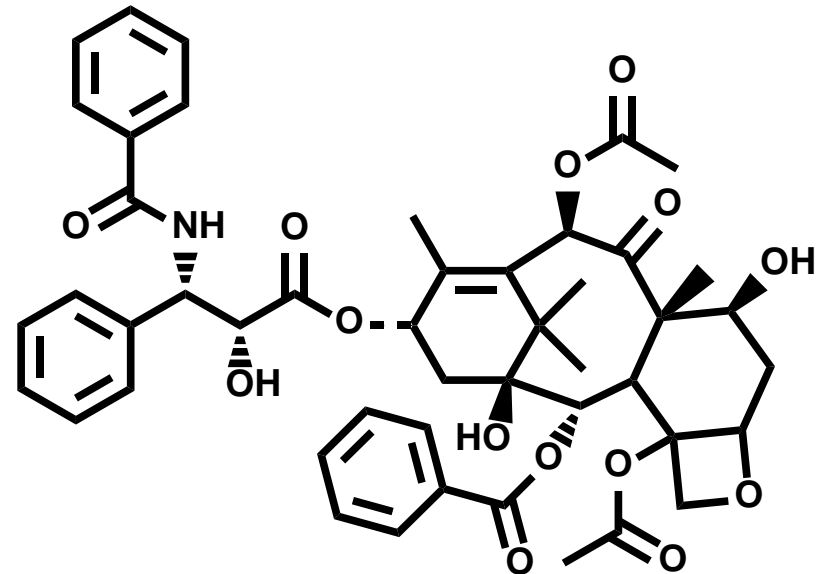


# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

❑ III) Serve as extremely useful natural drugs.  
e.g. Doxorubicin, Erythromycin, Vincristine,  
Taxol, Morphine and Digoxin



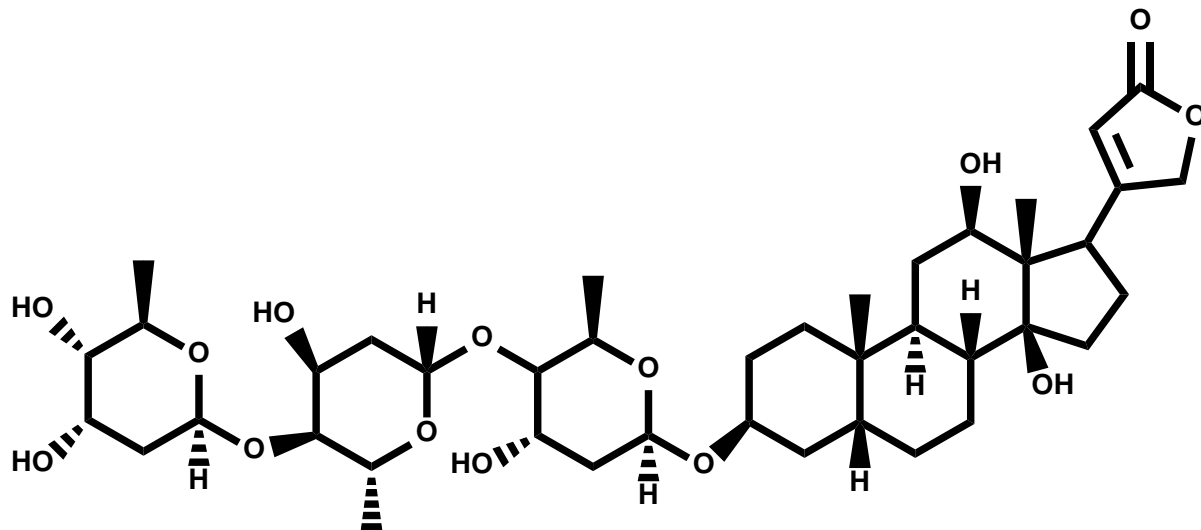
**Vincristine**  
**Leukemia**



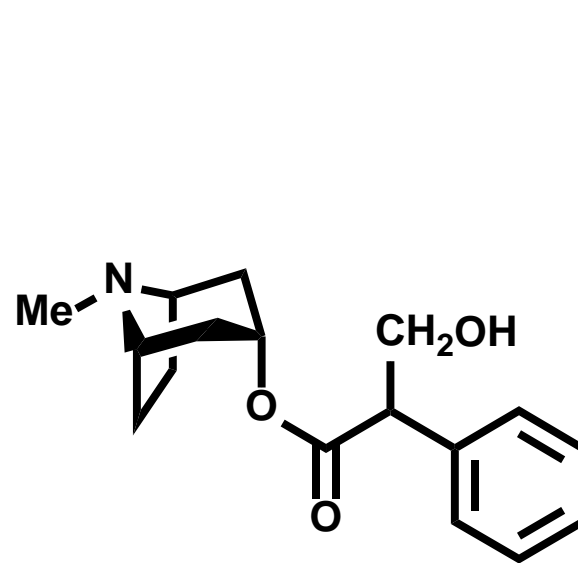
**Taxol**  
**Lung cancer**



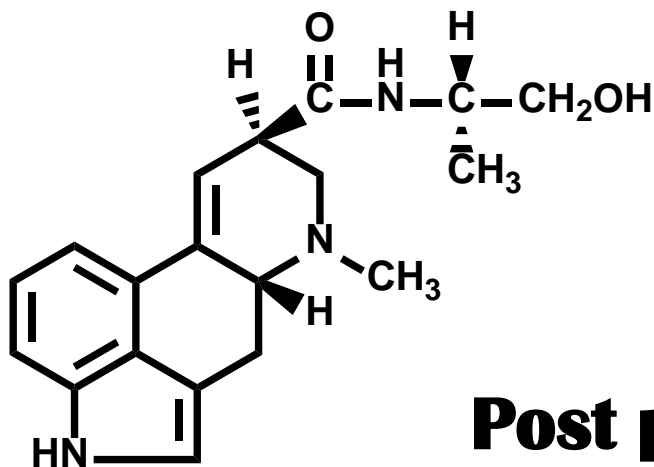
# ROLE OF NATURAL DRUGS IN MODERN MEDICINE



**Digoxin**  
**Congestive Heart failure**



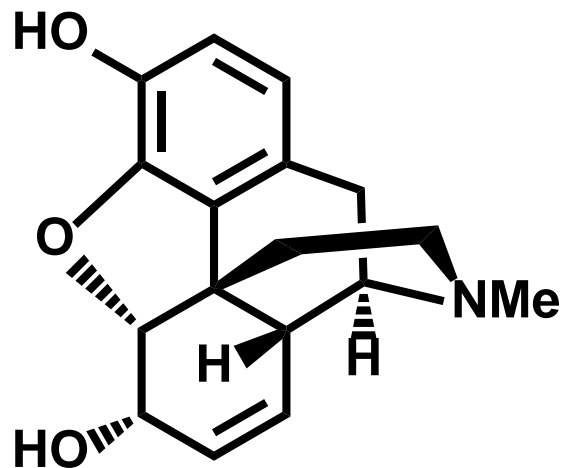
**Atropine**  
**Spasms**



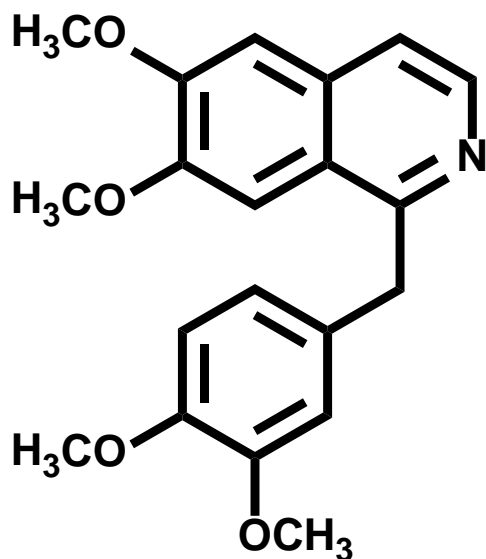
**Ergometrine**  
**Post partum heamorrhage**



# ROLE OF NATURAL DRUGS IN MODERN MEDICINE



**Morphine**  
**Narcotic anti-inflammatory**



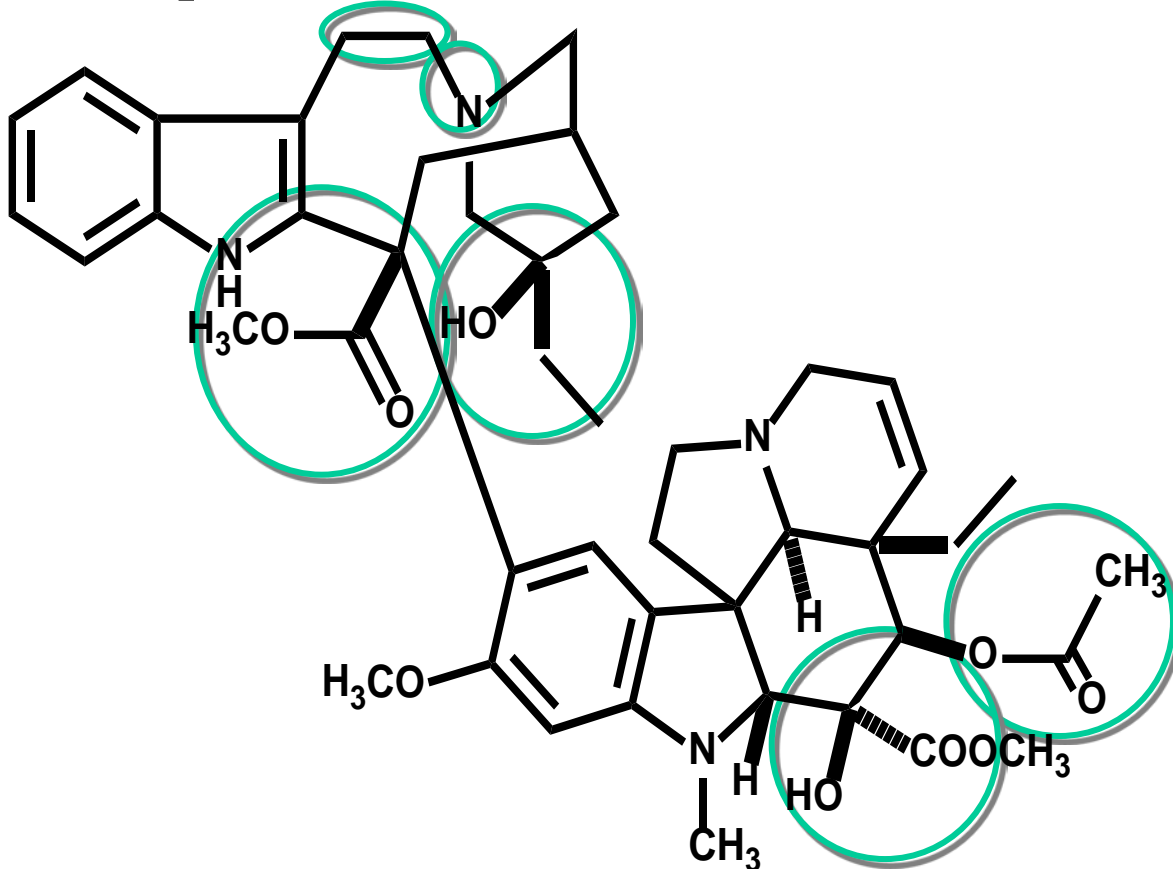
**Papaverine**  
**Smooth muscle relaxant**



# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

**IV) Provide new semi-synthetic compounds affording new therapeutic effect .**

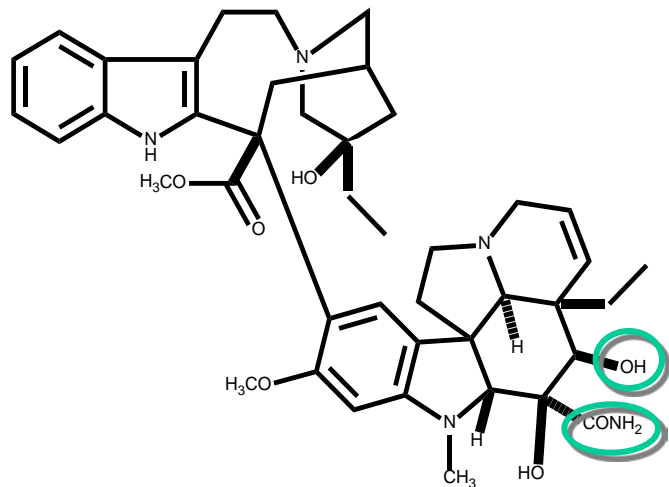
**A- Modification of vinblastine produced many new compounds with new anti-cancer activities**



**Vinblastine**  
**Velban®**  
**Lymph cancer**

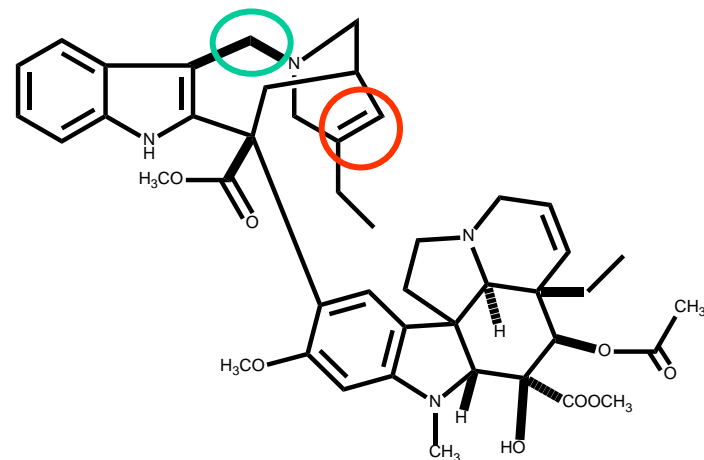


# ROLE OF NATURAL DRUGS IN MODERN MEDICINE



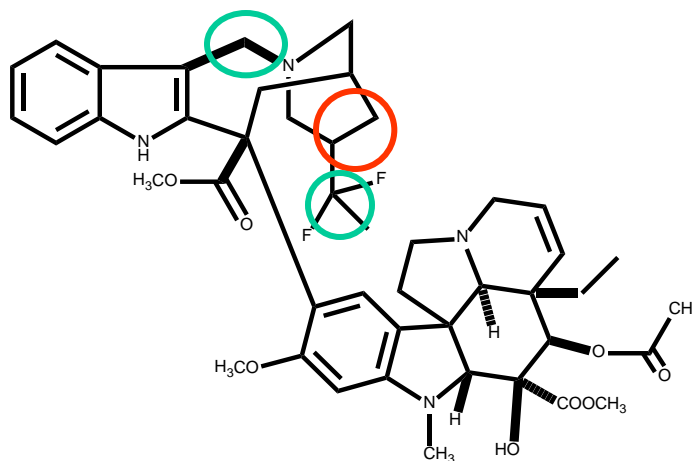
**Vindesine**

**Melanoma**



**Vinorelbine**

**Breast Cancer**



**Vinflunine**

**Bladder Cancer**

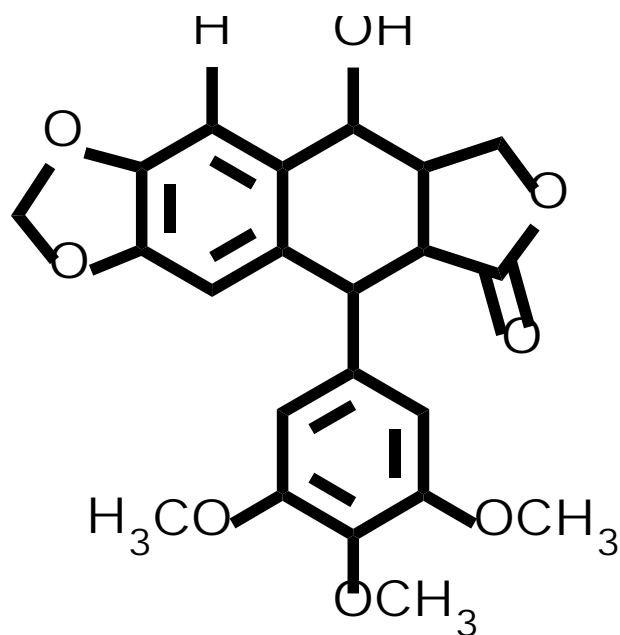




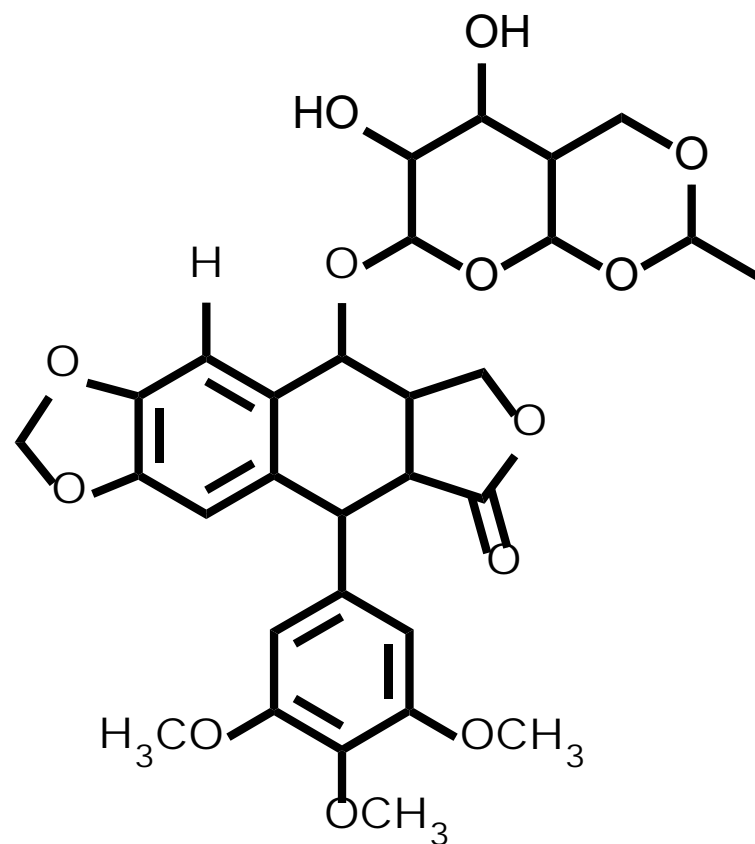


# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

**C- Modification of Podophyllotoxin side chain produced new compound with new anti-cancer activity Etoposide.**



**Podophyllotoxin**



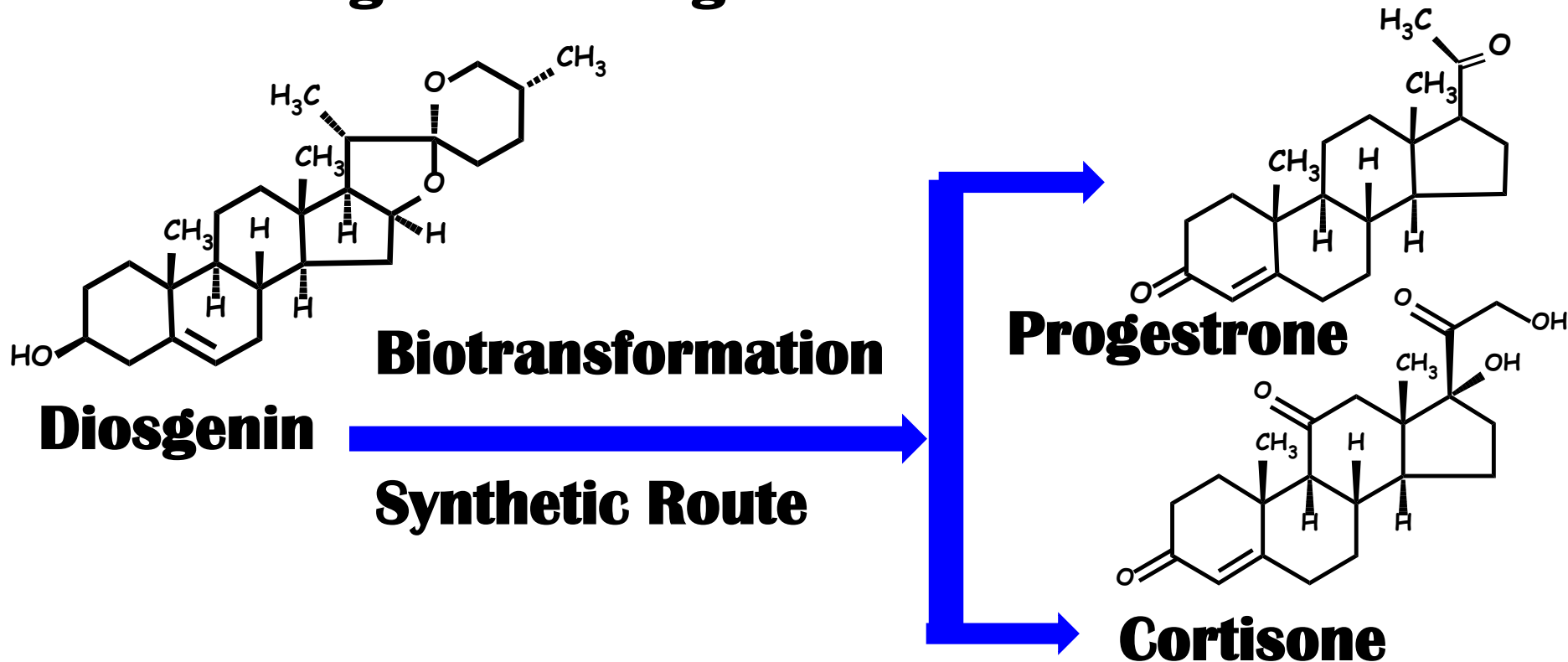
**Etoposide**



# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

## V) Modification of inactive natural product by suitable chemical and/or biological means into potent drugs.

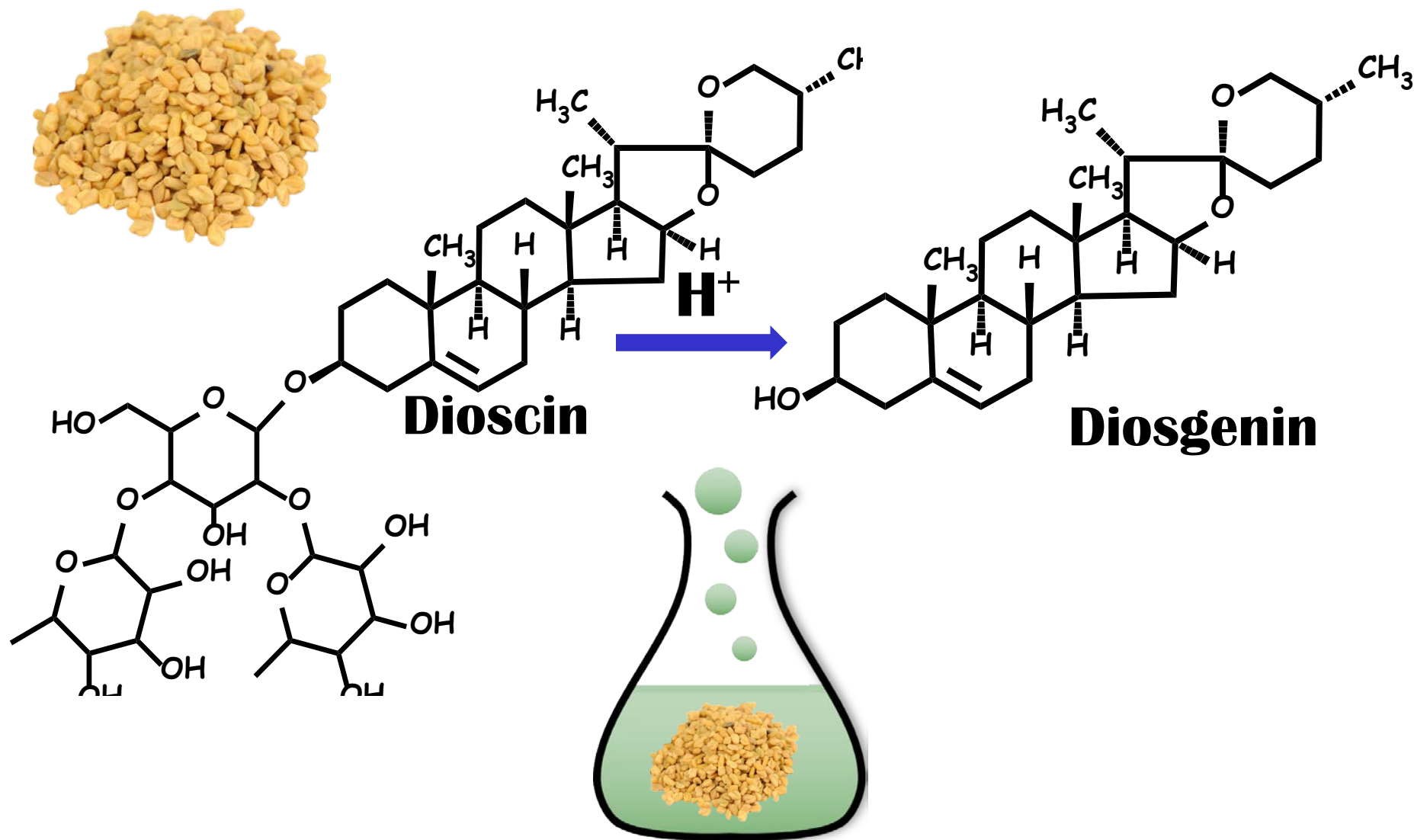
### Diosgenin to Progesterone and Cortisones





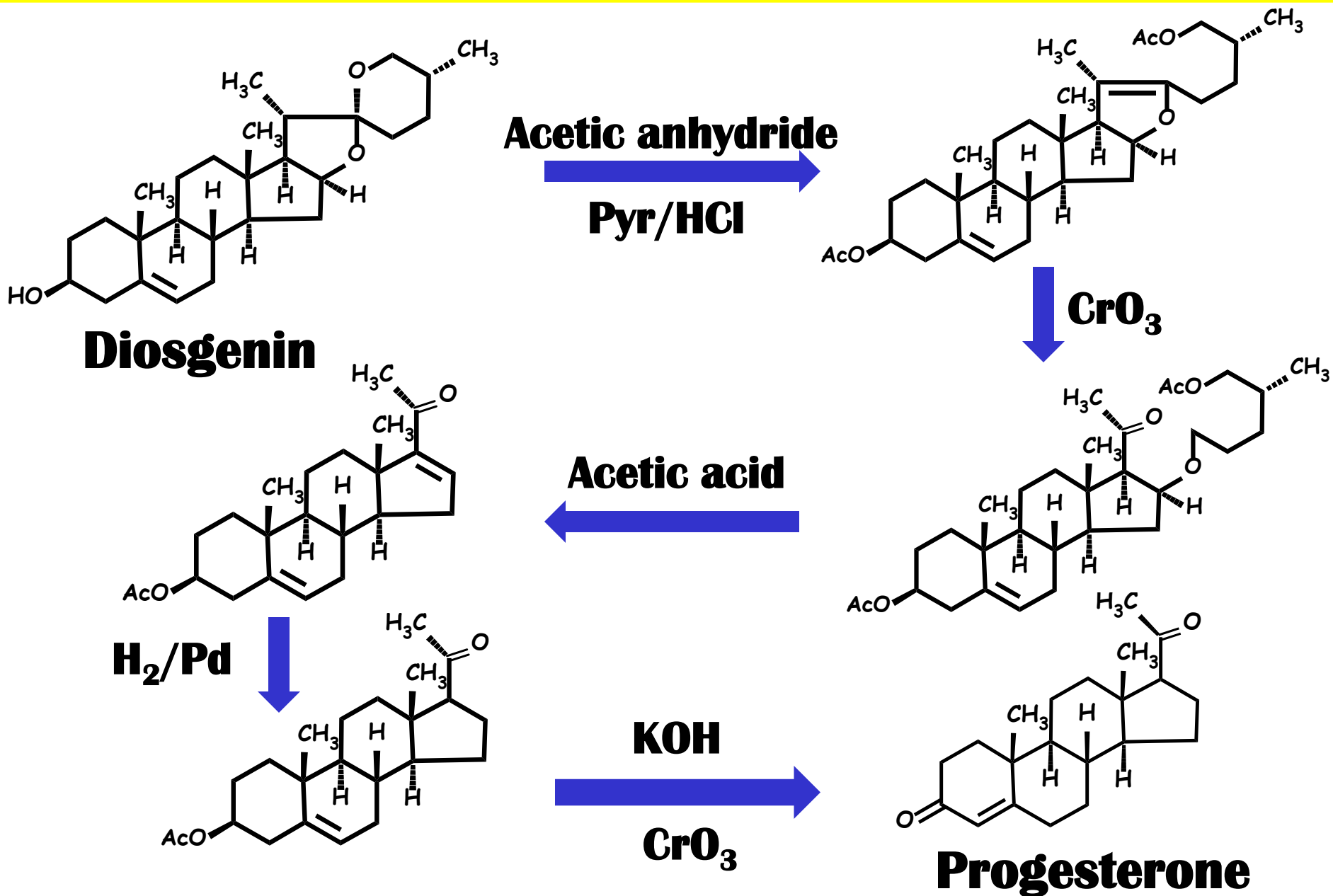
# ROLE OF NATURAL DRUGS IN MODERN MEDICINE

## Conversion of Dioscin to Diosgenin





# ROLE OF NATURAL DRUGS IN MODERN MEDICINE



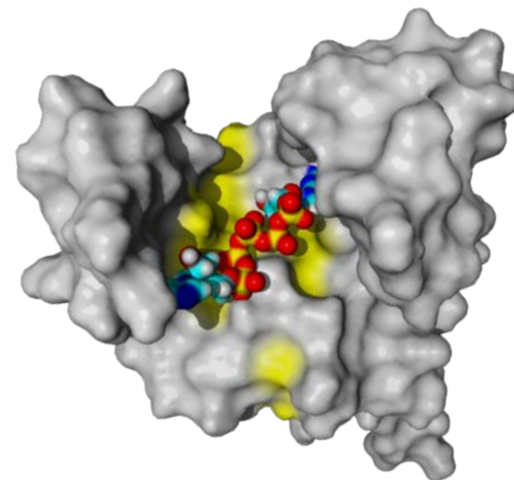
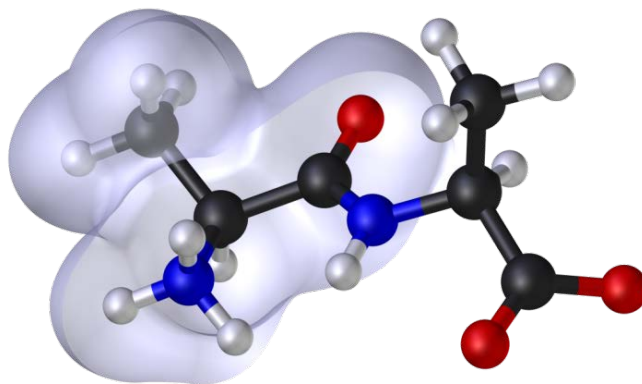
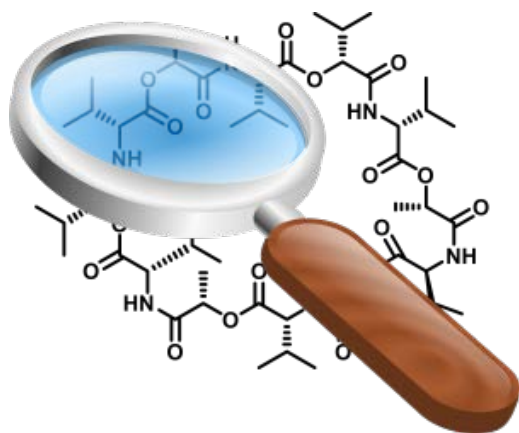






# FUTURE OF NATURAL PRODUCTS IN DRUG DISCOVERY

- ❑ **Computer-aided drug design techniques will facilitate the role of natural products in Drug Discovery.**





# **FUTURE OF NATURAL PRODUCT IN DRUG DISCOVERY**

- Advances in isolation technologies and analytical methods will also greatly facilitate Natural Products Drug Discovery.**



**HPLC**



**GC/MS**



**LC/MS**



**NMR**





THANK  
YOU

